

BULLETIN 202

IMP. BUR.  
16 MAY. 1914  
ENTOM.

MAY, 1909

NORTH CAROLINA

## AGRICULTURAL EXPERIMENT STATION

OF THE

COLLEGE OF AGRICULTURE AND  
MECHANIC ARTS

WEST RALEIGH

---

MANUFACTURE AND MARKETING OF COTTAGE  
CHEESE, SKIMMILK-BUTTERMILK  
AND ICE-CREAM.

N. C. COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

THE NORTH CAROLINA  
AGRICULTURAL EXPERIMENT STATION,  
UNDER THE CONTROL OF THE  
TRUSTEES OF THE A. AND M. COLLEGE.

GOVERNOR W. W. KITCHIN, *ex officio* Chairman, Raleigh.

C. W. GOLD.....	Raleigh	M. B. STICKLEY.....	Concord
E. M. KOONCE.....	Jacksonville	T. T. BALLINGER.....	Tryon
T. W. BLOUNT.....	Roper	N. B. BROUGHTON.....	Raleigh
D. A. TOMPKINS.....	Charlotte	O. L. CLARK.....	Clarkton
J. T. ELLINGTON.....	Smithfield	EVERETT THOMPSON..	Elizabeth City
W. E. DANIEL.....	Weldon	R. H. RICKS.....	Rocky Mount
W. H. RAGAN.....	High Point	O. MAX GARDNER.....	Shelby
W. B. COOPER.....	Wilmington	LOCKE CRAIG.....	Asheville

STATION STAFF.

D. H. HILL, President of the College.

C. B. WILLIAMS.....	Director and Agronomist
W. A. WITHERS.....	Chemist
F. L. STEVENS.....	Vegetable Pathologist
J. S. JEFFREY.....	Poultryman
F. C. REIMER.....	Horticulturist
R. S. CURTIS.....	Animal Husbandman
JOHN MICHELS.....	Dairy Husbandman
R. I. SMITH.....	Entomologist
G. A. ROBERTS.....	Veterinarian
J. G. HALL.....	Assistant in Plant Diseases
W. C. ETHERIDGE.....	Assistant in Farm Crops
J. K. PLUMMER.....	Assistant Chemist
A. R. RUSSELL.....	Assistant in Field Experiments
P. L. GAINES.....	Assistant Bacteriologist
F. W. SHERWOOD.....	Assistant Chemist
A. F. BOWEN.....	Bursar
C. P. FRANKLIN.....	Secretary and Stenographer

The Bulletins and Reports of this Station will be mailed free to any resident of the State upon request.

Visitors are at all times cordially invited to inspect the work of the Station, the office of which is in the new Agricultural Building of the College.

Address all communications to

N. C. AGRICULTURAL EXPERIMENT STATION,  
WEST RALEIGH, N. C.

## TABLE OF CONTENTS.

	PAGE.
Introduction .....	5
Preparation of Pure Cultures of Lactic Acid Bacteria .....	5
Making Cottage Cheese .....	6
Souring the Skimmilk .....	6
Heating the Curd .....	7
Draining the Curd .....	7
Grinding the Curd .....	8
Yield and Selling Price of Cheese .....	8
Making Skimmilk-Buttermilk .....	8
Souring the Skimmilk .....	8
Churning .....	9
Cooling .....	9
Straining and Bottling .....	9
Selling Price .....	9
Marketing Skimmilk-Buttermilk and Cottage Cheese .....	9
Selling Direct to Consumers .....	10
Food Value of Cottage Cheese and Skimmilk-Buttermilk .....	10
Serving Cottage Cheese .....	11
Marketing Ice-cream .....	11



# MANUFACTURE AND MARKETING OF COTTAGE CHEESE, SKIMMILK-BUTTERMILK AND ICE-CREAM.

---

BY JOHN MICHELS, DAIRY HUSBANDMAN.

---

In making cottage cheese and buttermilk the first and most important essential is good flavor. Next in importance is uniformity of product. Both of these essentials can be obtained with certainty only by the use of pure cultures of lactic acid bacteria in souring the skimmilk.

The natural souring of milk is due to lactic acid bacteria, which act upon the milk sugar, changing a portion of it into lactic acid. Milk always contains these souring bacteria, but, as a rule, there are present also various other types which produce undesirable flavors. To suppress the undesirable types of bacteria, it is necessary to reinforce the lactic acid organisms by adding large quantities of them in pure form, that is, unmixed with other classes of bacteria. Commonly, such pure cultures of lactic acid bacteria are known as starters.

## PREPARATION OF PURE CULTURES OF LACTIC ACID BACTERIA.

The cultures containing the lactic acid ferment are prepared commercially, and small samples, either in dry or liquid form, can be obtained from manufacturers at about seventy-five cents per bottle. The bottle thus obtained is emptied into a quart of pasteurized skimmilk, that is, skimmilk which has been kept at a temperature of about 170° F. for thirty minutes and then quickly cooled to about 70° F. As soon as the quart of skimmilk has thickened, which usually requires about twenty-four hours, it is ready for use.

In the process of heating, all of the active bacteria in the skimmilk are destroyed, thus leaving a clean field for the development of the lactic acid bacteria added to it from the bottle.

The method of using the lactic acid bacteria is similar to the use of yeast in breadmaking. The original germs obtained from the manufacturer may be propagated for weeks by daily transferring a small amount of the thickened skimmilk to newly pasteurized skimmilk. As a rule, one pound of the thickened skimmilk will sour thirty to forty pounds of sweet pasteurized skimmilk in twenty-four hours at a temperature of 70° F.

Parenthetically, it may be stated that pure cultures of lactic acid bacteria (starters) are also frequently used in souring cream for buttermaking. Indeed, the highest quality of butter is not possible without their use.

## MAKING COTTAGE CHEESE.

Hitherto no definite method has been employed in the making of cottage cheese, which, no doubt, is largely due to the fact that its manufacture has been almost entirely confined to the home. The method in common use consists essentially in placing curdled milk, either heated or unheated, in a linen or cotton cloth bag which is hung up in some convenient place to allow the curd to drain.

Where cheese is to be made on a commercial scale, this method has not been found satisfactory. After much experimentation we have

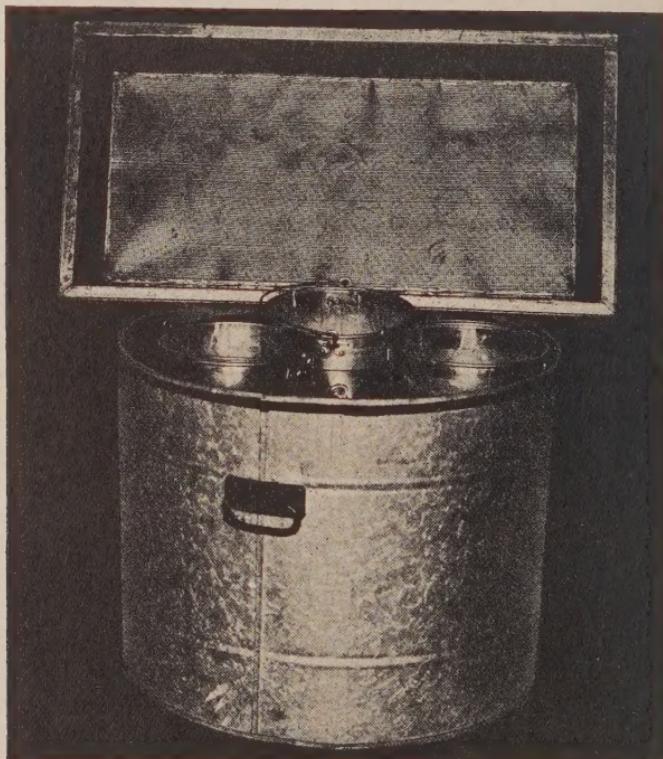


FIG. 1.—Strainer and Shotgun Cans in Water Tank.

succeeded in developing a method which has proven perfectly satisfactory in making cheese for city trade, and which it is felt can confidently be recommended for use by dairymen in general. The successive steps in this process are described in the paragraphs following.

*Souring the Skimmilk.*—Where from ten to twenty pounds of cheese are to be made at one time, the skimmilk is most satisfactorily soured in four to eight gallon shotgun cans which have a uniform

diameter of from eight to ten inches. Enough pure culture of lactic acid ferment is added to sour the skimmilk in about three hours at a temperature of 100° F. As a rule, one gallon of culture to every four gallons of sweet skimmilk will accomplish the souring in the given time.

The culture should be vigorously stirred and then thoroughly mixed with the skimmilk. As soon as this has been done the cans containing the mixture are placed in a tank of water, as shown in Fig. 1. In heating the skimmilk to 100° F. the water in the tank should never exceed 110° F. The high temperature employed in souring the skimmilk has several advantages: (1) it hastens the souring process; (2) it causes the skimmilk to curdle with less acid, thus making a milder cheese; and (3) the curd may be stirred as soon as curdled without danger of diminishing the yield.

Where large quantities of cheese are to be made, the skimmilk

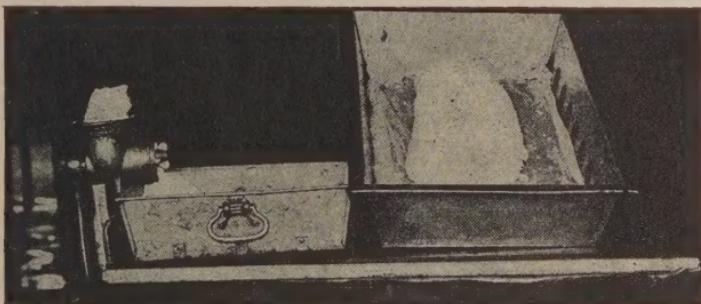


FIG. 2.—Curd in Strainer after pressing, and Curd Grinder.

should be soured in a common cream vat with an open end, which is usually used for adding ice to the water underneath. In the manufacture of cottage cheese, this open end is necessary in order to observe the temperature of the water used in heating the milk and curd.

*Heating the Curd.*—As soon as the skimmilk has thoroughly curdled, the curd should be raised to a temperature of 104° F. by heating the water surrounding the curd to about 115° F., and care should be taken never to heat it above 120° F. During the heating the curd should be constantly stirred with a stirrer consisting of a four-inch heavy tin disc attached to an iron rod. Where a cream vat is used, the stirring is done by hand. When the curd has reached a temperature of 104° F. the water surrounding it should be removed and the stirring continued for ten minutes more, after which it is ready to drain.

*Draining the Curd.*—This is best accomplished in a tin strainer with perforated sides and bottom like that shown in Figs. 1 and 2. The strainer should be of ample size to hold conveniently all the curd,

and to expedite drainage. A piece of cheese cloth should be spread over the strainer before receiving the curd. The latter must be hand-stirred as soon as it reaches the strainer, but the stirring should be done very carefully at the start to avoid loss by mashing the particles. Continue the operation until the curd is firm enough to prevent the particles from sticking together, which usually requires about five minutes. When proper firmness is reached, the curd is wrapped in the cloth strainer and squeezed with the hands until most of the whey has been removed. This operation requires only a few minutes, and care must be taken not to press the curd too hard. After pressing, the curd appears in a roll like that shown in Fig. 2.

*Grinding the Curd.*—Immediately after pressing, the curd is run through an ordinary meat grinder (see Fig. 2). The machine should be set for coarse grinding and should be large enough to enable one to complete the operation in a few minutes.

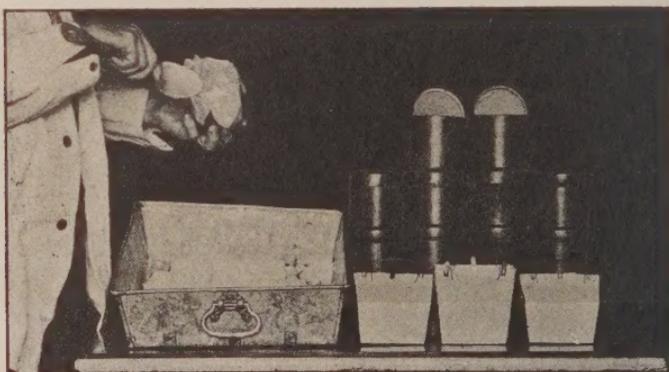


FIG. 3.—Cottage Cheese Packages and method of filling them.

After grinding the curd, it is soaked with sweet whole milk, using about one and one-half quarts for every ten gallons of skimmilk used.

The cheese is then put into packages by means of a large spoon, in the manner shown in Fig. 3. One-pound packages appear to be the most satisfactory for the average trade.

*Yield and Selling Price of Cheese.*—On an average it requires 7.1 pounds of skimmilk to make one pound of cottage cheese. The cheese was furnished grocers at ten cents per pound and was retailed by them at fifteen cents. We were able to dispose of twenty pounds per day at this price on the local market, a city in which the cheese had never been handled before.

#### MAKING SKIMMILK-BUTTERMILK.

*Souring the Skimmilk.*—As soon as the skimmilk leaves the separator, whole milk is added to it at the rate of one gallon to twenty gal-

lons of skimmilk. This gives the mixture a fat content which approximates that of natural buttermilk. A large quantity of pure culture of lactic acid bacteria (starter) is next added and the temperature brought to 70° F. Enough culture is added to curdle the skimmilk in about six hours at the temperature mentioned. When a temperature above 70° F. is employed, there is a tendency for the skimmilk to "whey off" after it has curdled.

*Churning.*—When thoroughly curdled, the skimmilk is placed in a churn and churned for forty minutes in the same way that cream is in making butter. The churning process thoroughly breaks up the curd clots, resulting in a smooth, thick liquid which cannot be distinguished from ordinary good buttermilk.

*Cooling.*—Immediately after the buttermilk leaves the churn, the temperature should be reduced below 50° F. to prevent further development of acidity. Ordinary milk and cream coolers with enlarged holes in the distributing receptacle will answer very satisfactorily.

*Straining and Bottling.*—After cooling, the buttermilk should be run through a strainer consisting of one thickness of cheese cloth to remove any unbroken curd clots. As soon as strained the buttermilk is bottled or put in tin cans holding from one to five gallons, after which it is placed in the refrigerator, where it should be held at a temperature of 40° to 45° F. until ready for delivery.

*Selling Price.*—The buttermilk made by us was sold to drug stores, lunch counters and hotels at five cents per quart in quart bottles and at fifteen cents per gallon in tin cans holding from one to five gallons. On an average, fifteen gallons were readily sold daily on the local market.

In the larger cities, buttermilk sells at a considerably higher price than given above. Thus, for example, the writer found that buttermilk during the past summer was furnished in bulk in Norfolk at from twenty-five to thirty cents per gallon. Considering both its food and tonic properties, buttermilk may be considered cheap at ten cents per quart.

#### **MARKETING SKIMMILK-BUTTERMILK AND COTTAGE CHEESE.**

What is said here with reference to this subject is a narration of our own experience in introducing these products in a city where they had never been used before.

In trying to sell skimmilk-buttermilk, it is necessary, in the first place, to explain that this product when made as described above is almost identical with the highest grade of natural buttermilk, both in composition and physical properties, and therefore in palatability and wholesomeness. Indeed, it is not thought possible under average conditions to secure natural buttermilk of as uniform a quality or of as fine a flavor as can be obtained from skimmilk. When these facts are

explained to dealers and consumers, any prejudice which might exist against this artificial product will gradually disappear.

The dealers in buttermilk were each furnished with an attractive display sign calling attention to the fact that the product was for sale at the particular place. Buttermilk is not commonly found at soda fountains, and unless conspicuous signs are posted at these places the public will not call for it. We believe that four-fifths of the buttermilk sold by us was due to these signs. Attention was also called to the product through the local press.

A similar arrangement was made with grocers in handling the cottage cheese. With small outlay for advertising in a city where these products had never been handled, we were soon able to dispose of over one hundred dollars worth per month.

Dealers should keep the cottage cheese and buttermilk in refrigerators, and neither of the products should be sold when more than two days old; the fresher the product the better.

#### **SELLING DIRECT TO CONSUMERS.**

It is recommended that dairymen supplying milk and cream to cities undertake the manufacture of cottage cheese and skimmilk-buttermilk, and to sell these products direct to consumers. This would insure getting the products fresh to the consumer every day, and would not entail any delivery charges, since the products would be delivered at the same time as the milk and cream. Furthermore, the profits of the middleman would be added to those of the dairymen. It is confidently believed that this would be the means of increasing the returns from dairies from ten to fifty per cent. The buttermilk could readily be disposed of at five cents per quart and the cottage cheese at from ten to fifteen cents per pound. Dairymen who could produce more of these products than could be disposed of to consumers direct could also supply them to the various local dealers in dairy products.

#### **FOOD VALUE OF COTTAGE CHEESE AND SKIMMILK-BUTTERMILK.**

These, when made as herein described, not only have a high food value, but possess tonic or medicinal qualities which are especially beneficial during warm weather. The food value of cottage cheese is approximately the same as that of beefsteak, pound for pound; and as for buttermilk, two quarts of this may be considered fully equal to one pound of beefsteak. Thus it will be seen that cottage cheese at fifteen cents per pound and buttermilk at seven cents per quart are no more expensive than steak at fifteen cents per pound.

**SERVING COTTAGE CHEESE.**

When the cheese is made according to the method given above, it may be served without any further treatment. Its palatability, however, may be improved by the addition of cream. Additional salt and some pepper is also preferred by some. Others prefer adding sugar or syrup. Caraway and sage are also sometimes used to flavor the cheese.

**MARKETING ICE-CREAM.**

Hardly any attempt has yet been made by cream producers living within driving distance of cities to convert their cream into ice-cream and sell this product direct to consumers. This is somewhat surprising, since the largest profits in the cream business have hitherto been made by what may be called the middleman, the city ice-cream manufacturer.

It is a vital matter with all producers to reach consumers direct wherever this is possible. Dairymen, for example, have long recognized the fact that the only way to get fancy prices for butter is to sell it direct to consumers. The same course must be pursued with respect to cream to get fancy prices for this product.

The essential thing in building up a good ice-cream trade is to make the best product possible. The market is glutted with cheap, inferior ice-cream, and the call now is for a high-grade product. Fortunately, the public is beginning to realize that there is positive danger in eating ice-cream made from stale milk or cream, and the public also seems to have begun to understand that the bulk of ice-cream is made with so-called thickeners, like gelatine, corn starch, tapioca, arrow root, and others. Many of the so-called ice-creams contain no cream whatever. The highest quality of ice-cream contains nothing but pure cream, sugar and flavoring.

